Environmental Assessment

of the

Remediation of Environmental Contaminants

at

Lawrence Livermore National Laboratory

Experimental Test Facility Site 300

California

September 2000

U.S. Department of Energy
Oakland Operations Office
Oakland, CA 94612
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Preface

This Environmental Assessment (EA) for proposed environmental remediation at Lawrence Livermore National Laboratory (LLNL) Site 300 provides an analysis of the potential environmental impacts of the proposed action in order to determine whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact. It provides a brief discussion of the purpose and need for the proposed action, a description of the proposed action and alternatives, and an analysis of the potential environmental impacts of the proposed action and alternatives. It also provides a listing of names of outside agencies and persons contacted during preparation of the EA. The EA complies with the Council on Environmental Quality's "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations*, Title 4, Parts 1500–1508 (40 CFR 1500-1508) and the U.S. Department of Energy's (DOE) National Environmental Policy Act (NEPA) Implementing Procedures (10 CFR 1021).

Site 300 is a federal facility operated for DOE by the University of California, and was placed on the Federal National Priorities List in 1990. The activities described in this document are part of an ongoing cleanup process regulated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA decisionmakers will consider this EA when finalizing site cleanup measures in the Interim Site-Wide Record of Decision for LLNL Site 300. The proposed action identified in this document is that which has been identified during the Proposed Plan phase of the CERCLA process as the action that DOE and the regulatory agencies believe will best protect human health and restore the environment at Site 300 in a responsible, cost-effective manner and ensure compliance with applicable or relevant and appropriate requirements. DOE is the responsible party and lead agency for CERCLA investigations and cleanup activities at Site 300. The regulatory agencies include the U.S. Environmental Protection Agency (U.S. EPA), the California EPA Department of Toxic Substances Control (DTSC), and the Central Valley California Regional Water Quality Control Board (RWQCB). Since agencies of the State of California maintain partial discretionary decisionmaking authority over the project through its approval of the Record of Decision, the project also requires review under the provisions of the California Environmental Quality Act (CEQA). DTSC is the "CEQA lead agency" for this project. Therefore, this document has been formatted so that it also contains essential elements for compliance with CEQA. Table 1, below, is a cross-index that shows the location of certain required CEQA-related checklist information within this document. Other CEQA-related information appears in Appendix A.

Table 1. Location of CEQA checklist items within this Environmental Assessment

CEQA Element	NEPA Heading	Location in document	
		Description of Environmental Setting	Analysis of Potential Impacts and Findings
Earth	Earth	Chapter 3	Chapter 4
Air	Air	Chapter 3	Chapter 4
Surface and Groundwater	Water Resources	Chapter 3	Chapter 4
Plant and Animal Life	Plant and Animal Life	Chapter 3	Chapter 4
Land Use, Public Health and Safety, Population / Housing / Recreation, Zoning, Plans and other land use controls	Land Use and Socioeconomics	Chapter 3	Chapter 4
Natural Resources, Transportation / Circulation, Public Services, Energy, Utilities	Infrastructure	Chapter 3	Chapter 4
Noise	Noise	Chapter 3	Chapter 4
Aesthetics	Aesthetics	Chapter 3	Chapter 4
Cultural / Paleontological Resources	Cultural Resources	Chapter 3	Chapter 4
Cumulative Effects, Mitigation Measures	Environmental Impacts	Chapter 4	Chapter 4
Risk of Upset	Accident Scenarios	Appendix B	Appendix B

Summary

The Lawrence Livermore National Laboratory (LLNL) in Livermore, California, is owned by the U.S. Department of Energy (DOE) and operated by the University of California. DOE proposes to remediate environmental contaminants at LLNL's Experimental Test Facility, Site 300 (Site 300) in the hills east of Livermore and southwest of Tracy, California (Figure 1). The purpose of and need for the remediation is to comply with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and applicable or relevant and appropriate requirements and remedial action objectives specified in Chapter 2 of the Site-Wide Feasibility Study (Ferry et al., 1999).

The proposed remediation would occur in the following eleven areas which are depicted in Figure 2:

- Building 834
- Pit 6 Landfill
- High Explosives Process Area (including Building 815, High Explosives Lagoons and High Explosives Burn Pit)
- Building 850 Firing Table
- Pit 2 Landfill
- Building 854
- Building 832 Canyon (including Buildings 832 and 830)
- Building 801, Pit 8 Landfill
- Building 833
- Building 845 Firing Table, Pit 9 Landfill
- Building 851 Firing Table

The proposed remediation would employ five approaches for environmental protection and cleanup: (1) monitoring, (2) risk and hazard management, (3) monitored natural attenuation, (4) groundwater and/or soil vapor extraction and treatment, and (5) soil removal.

The alternatives considered in this document include the proposed action and the no action alternative. Under the no action alternative, DOE would continue much of its current monitoring and treatability study cleanup efforts, but would not perform the additional remediation described in this document; therefore, some of the potential impacts associated with the cleanup would not occur. However, the no action alternative

would not meet DOE's purpose and need to protect human health and the environment from past releases of contaminants and restore beneficial uses of natural resources by conducting cost-effective, science-based, state-of-the-art environmental restoration, or be in compliance with State and Federal regulations. Environmental resources are described and discussed in proportion to their potential to be affected by the proposed and no action alternatives. The principal environmental resources discussed in this Environmental Assessment are earth, air, water resources, plant and animal life, land use and socioeconomics, infrastructure, noise, aesthetics, and cultural resources. Analysis indicates that the proposed action would not cause a significant effect to the human environment.

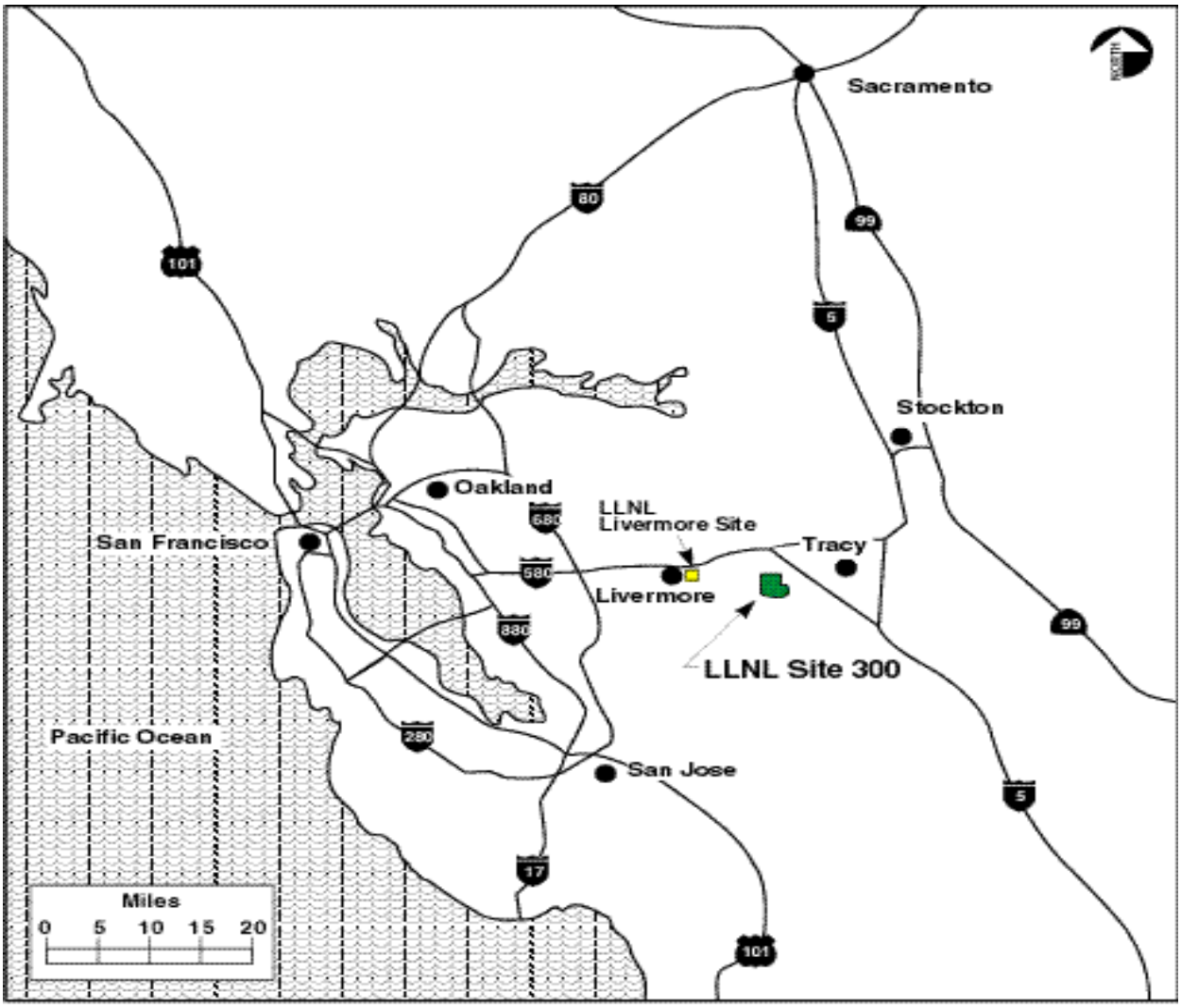

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Figure 1. Location of LLNL Livermore Site and Site 300.

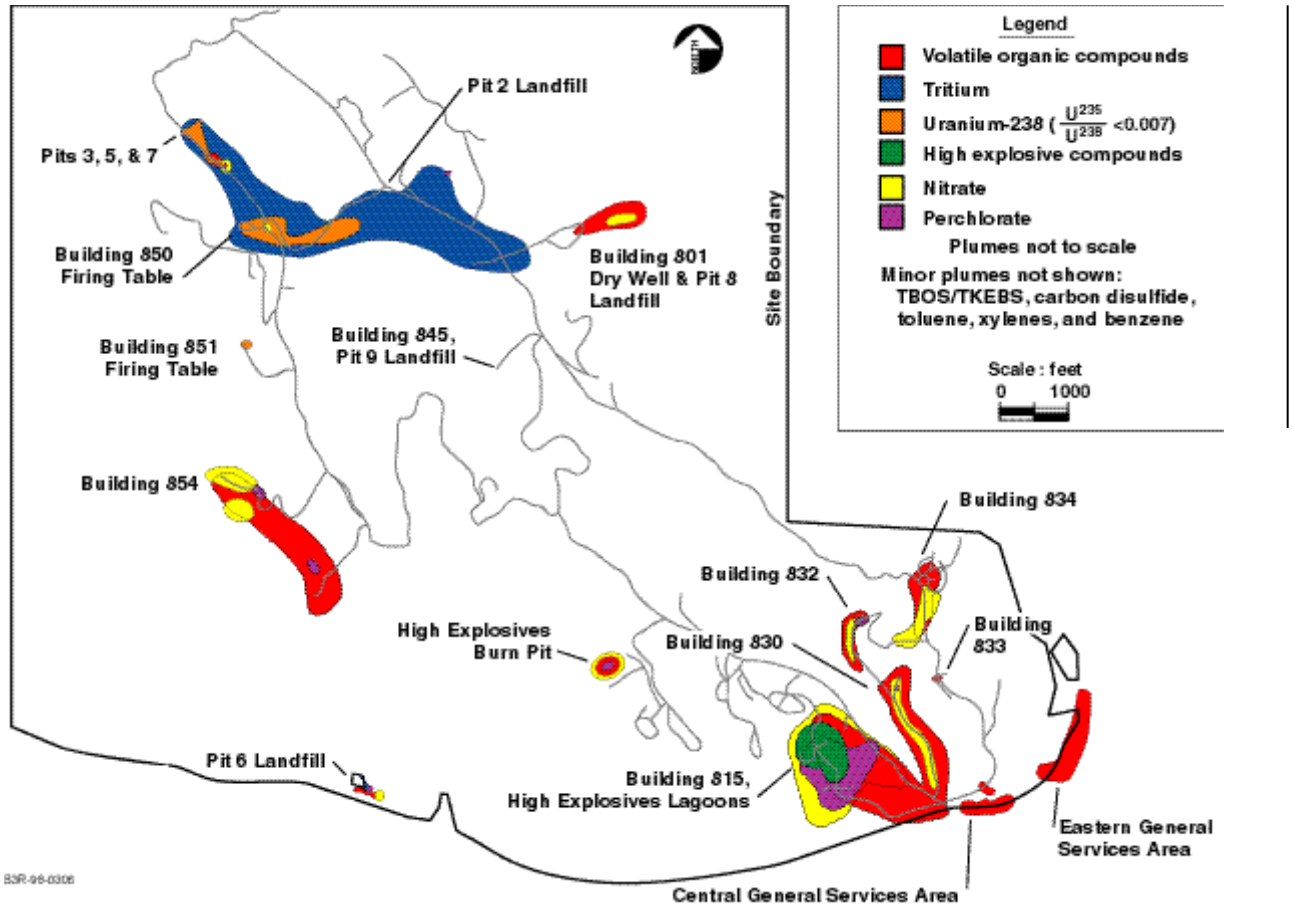

Figure 2. Extent of groundwater contamination at LLNL Site 300.

1. Purpose and Need

LLNL Site 300 is an 11-square mile DOE facility operated by the University of California. It is located in the Altamont Hills approximately 18 miles east of Livermore and 10 miles southwest of Tracy (Figure 1). The majority of the site lies in San Joaquin County; however, the far-western portion is in Alameda County. Access to Site 300 is restricted by perimeter fencing and other security measures. Although nuclear weapons have never been and are not currently being tested at Site 300, non-fissile radioactive materials may be included in explosive components during firing table activities. As a consequence, radioactive debris may be generated from detonation of these test assemblies. Site 300 is primarily a high explosives experimental test facility that has conducted research, development, and testing of high explosive materials and other research and development activities since 1955. During earlier site operations, a number of contaminants were released to the environment via surface spills, leaching from unlined landfills and pits, high explosives test detonations, and past disposal of waste fluids in lagoons and dry wells (sumps). The primary contaminants at Site 300 include the solvent trichloroethylene (TCE) and other volatile organic compounds (VOCs), high explosives compounds such as high melting explosive (HMX) and

research department explosive (RDX), perchlorates, tritium (a radioactive isotope of hydrogen), depleted uranium, nitrates, polychlorinated biphenyls (PCBs), silicone-based oil tetrabutyl orthosilicate (TBOS) and tetra-kis-2-ethylbutyl orthosilicate (TKEBS), and metals. In some cases, these compounds have migrated into groundwater (Figure 2). DOE proposes to remediate the contaminants. The purposes of the proposed remediation are to reduce contaminant concentrations in soil and groundwater, mitigate risk to human and environmental receptors, and to restore beneficial use of groundwater.

The need for remediation is to comply with CERCLA and applicable or relevant and appropriate requirements specific to cleanup at Site 300. DOE began environmental restoration at Site 300 in 1981 under the oversight of the California RWQCB. In 1990, the U.S. EPA placed Site 300 on the National Priorities List. Since then, the U.S. EPA and the State of California have jointly regulated the environmental cleanup process with DOE being the responsible party and lead agency. DOE, the U.S. EPA, the DTSC, and the RWQCB entered into a Federal Facility Agreement on June 29, 1992, to coordinate efforts, standardize requirements, and ensure compliance for environmental cleanup at Site 300.

2. Alternatives

Two alternatives are analyzed in this document: the proposed action and the no action alternative. Many alternatives for remediation technology were described in Chapter 4 of the Site-Wide Feasibility Study, a CERCLA document (Ferry et al., 1999). DOE selected a preferred alternative from the Site-Wide Feasibility Study and justified it in another CERCLA document, the Proposed Plan (Dresen et al., 2000), that was agreed to by the regulators (EPA, DTSC, and RWQCB). DOE performed an evaluation and comparison of remedial alternatives using the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) criteria for analysis of alternatives, and selected its preferred alternative by finding the best balance of criteria tradeoffs. Each alternative was evaluated using the following NCP criteria: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, and volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance.

Because the NEPA review process was initiated after the Proposed Plan was completed, this EA analyzes DOE's and the regulators' preferred alternative (the proposed action) since the other alternatives are no longer under consideration. Should this EA find that the impacts of the proposed remediation technologies are significant or unacceptable, DOE, in consultation with the regulatory agencies, may elect to modify its remediation plans or prepare an Environmental Impact Statement.

Proposed Action Alternative

Under the proposed action alternative, eleven areas of Site 300 would be remediated (Table 2); these areas correspond to Operable Units (OUs) 2 through 8, as described in the Site-Wide Feasibility Study and the Proposed Plan for LLNL Site 300. Five other areas, the General Services Area, the Pit 7 Complex (which includes Pits 3 and 5 of OU 5), Building 865, Building 812, and the Sandia Test Site are excluded from this process. Remediation of the General Services Area has already been the subject of a NEPA / CEQA review and the cleanup is currently being implemented (U. S. DOE, 1997a). Alternatives for remediating the other four areas are not yet available for NEPA review because the characterization of the contamination and analysis of potential remedies are ongoing.

Under the proposed action alternative, five broad categories of cleanup technologies would be employed in eleven contaminated areas as shown in Table 2.

Table 2. Proposed cleanup technologies for eleven contaminated areas at Site 300.

Area	Cleanup Technologies				
	Monitoring	Risk & hazard management	Monitored natural attenuation	Groundwater and/or soil vapor extraction & treatment	Soil removal
Building 834	✓	✓		✓	
Pit 6 Landfill	✓	✓	✓		
High Explosives Process Area	✓	✓		✓	
Building 850 Firing Table	✓	✓	✓		✓
Pit 2 Landfill	✓				
Building 854	✓	✓		✓	
Building 832 Canyon	✓	✓		✓	
Building 801, Pit 8 Landfill	✓				
Building 833	✓	✓			
Building 845 Firing Table, Pit 9 Landfill	✓				
Building 851 Firing Table	✓				

Monitoring is defined as the routine, periodic, baseline sampling and analysis of contaminated media not associated with the operation and optimization of remediation systems. Water level measurements and water sampling for chemical analysis would be performed regularly. Samples would be analyzed for all contaminants of concern. In most cases, monitoring would consist of collecting groundwater samples from existing monitor wells and surface water bodies. In some cases, new monitoring wells would be drilled and unimproved roads may be bladed (and graveled or otherwise improved) in order to access those wells. It is estimated that approximately 26,000 feet of roads would be created site-wide. Approximately 200 additional wells would be drilled over the life of the project; however, not all are related to monitoring. Some would be used for groundwater extraction or injection. After the completion of remediation at Site 300 (30 to 50 years), all wells would be sealed and abandoned.

The overall goals of risk and hazard management are to control exposure to contaminants and to ensure the proposed action protect human health and the environment while cleanup objectives are being achieved. Administrative controls are the basis of risk and hazard management, such as restricting building access, ventilation controls, and measures to prevent people from drinking contaminated groundwater.

Monitored natural attenuation consists of natural physical, chemical or biological processes that act without human intervention to reduce the amount of contamination in soil or groundwater. For example, tritium decays (or attenuates) naturally to non-toxic by-products. As a cleanup approach, monitored natural attenuation relies on these natural processes to achieve cleanup standards. A monitored natural attenuation remedy consists of monitoring and tracking the natural degradation of contaminants in

the environment to make sure that there are no damaging effects on human health and the environment. This method has proven effective for certain contaminants (for example, gasoline and radionuclides with short half-lives). Recent studies have demonstrated that under certain conditions monitored natural attenuation may also be appropriate for other Site 300 contaminants, such as VOCs and high explosives. To be acceptable, the timeframe to achieve cleanup standards must be comparable to that expected for active remediation.

Groundwater extraction involves pumping groundwater from specially designed wells and treating it to remove contaminants before discharge to the ground or air. The extracted water can be treated using granular activated carbon, bioreactors, air sparging, or ion exchange systems, depending on the contaminants. The objectives of groundwater extraction and treatment may include reducing the amount and concentration of contaminants, stopping the spread of contaminants, reducing risk, and/or restoring beneficial uses of groundwater. No extraction of tritium-containing groundwater would occur under the proposed action.

Soil vapor extraction utilizes special wells and pumps to extract contaminated vapors in the soil above the water table. The vapors are then treated to remove contaminants before discharge to the atmosphere. This technology is effective only for contaminants that evaporate relatively easily, such as TCE. The extracted vapor is treated using granular activated carbon. Soil vapor extraction is often combined with groundwater extraction to increase the effectiveness of the cleanup. Extraction of soil vapor and groundwater are presumptive remedies as defined by EPA. A number of presumptive remedies have been identified by EPA as being effective in many situations, and have been implemented at many cleanup sites. Use of presumptive remedies reduces the justification required and streamlines the technology evaluation and selection process.

Enhanced *in situ* (in place) bioremediation is another cleanup method that can be employed. The construction activities involved are similar to monitoring and groundwater and/or soil vapor extraction and treatment in that wells would have to be drilled and roads would be built. It consists of injecting nutrients into the subsurface to encourage the microbes already living in the ground to flourish and chemically degrade contaminants. These microbes break down the contamination into less toxic compounds. While this technique is not proposed at this time, it may be employed at a later date if testing proves it to be effective at Site 300.

At the Building 850 firing table, explosive tests contaminated approximately 40,000 square feet of the adjacent soil. This soil would be removed to a depth sufficient to reach clean soil, as defined by cleanup standards. The total estimated volume of soil to be removed is approximately 800 cubic yards. The soil is assumed to be mixed low-level radioactive and hazardous waste, and would be disposed of off site at a licensed treatment, storage, and disposal facility. In addition, a contaminated sand pile would

be removed from the Building 850 firing table. The sand pile covers approximately 1,250 square feet, and is 10 feet high. The estimated volume is 460 cubic yards, and is assumed to be low-level radioactive waste that would be disposed of off site at a licensed treatment, storage, and disposal facility.

Disturbances of streambeds or banks would comply with the California Department of Fish and Game Code regarding streambed alterations. Clean water effluent from treatment units would be discharged such that no new wetlands would be created. This is generally accomplished in one of three ways: (1) discharge into the air via misting, (2) surface discharge–changing the location periodically, or (3) injection into the subsurface via well or french drain. These methods of discharging treated water would not result in surface runoff that would cause soil erosion or the creation of new wetlands or riparian vegetation. Soil disturbing activities would require a wildlife pre-activity survey to identify any potential impacts to wildlife. If sensitive species or their habitats were discovered during this survey, remediation action plans would be altered to avoid impacts.

No Action Alternative

Under the no action alternative, all treatability study cleanup activities would continue unless determined to be ineffective in remediating contaminants. Remediation would also continue in the General Services Area, according to the existing CERCLA Record of Decision (U.S. DOE, 1997a). Current cleanup activities include monitoring and more aggressive remedies including soil vapor and groundwater extraction and treatment. Monitored natural attenuation is occurring at the Pit 6 Landfill and the Building 850 Firing Table. Groundwater and/or soil vapor extraction is occurring at the High Explosives Process Area, Building 854, Building 834, and the Building 832 Canyon. The areas that are currently being treated with groundwater and/or soil vapor extraction are the same areas that would be treated with those technologies under the proposed action alternative. However, under the proposed action alternative, the number of treatment units would increase.

3. Affected Environment

Descriptions of the natural environment are presented in Chapter 1 of the Site-Wide Feasibility Study (Ferry et al., 1999). Other detailed descriptions of the Site 300 environment can be found in the site-wide Environmental Impact Statement/Environmental Impact Report (EIS/EIR; U.S. DOE, 1992) and the Site-Wide Remedial Investigation Report (Webster-Scholten, 1994). The descriptions presented below are those that may be needed to assess impacts as required under NEPA and that may have not been presented in the above-mentioned references.

Earth

Descriptions of the geology, hydrology, and other aspects of the natural environment are presented in Chapter 1 of the Site-Wide Feasibility Study (Ferry et al., 1999). Geology is also described in Section 4.8 of the site-wide EIS/EIR (U.S. DOE, 1992). The majority of the ground surface of the 11-square mile site is undisturbed soil and rock. Disturbance is associated with sparsely placed facilities connected by a network of roads. In general, the highest concentrations and greatest extent of soil and rock contamination coincide with areas of known surface or near surface releases. The contaminants most frequently found in release areas in soil and rock at Site 300 are TCE, perchloroethylene (PCE), high explosive compounds, nitrates, perchlorates, depleted uranium, metals and tritium. Detailed discussions of the nature and extent of contamination of soil and rock are presented in Section 4 of Chapters 9 through 14 of the Site-Wide Remedial Investigation Report (Webster-Scholten, 1994).

Air

Meteorology is discussed in Section 4.7 and air quality is discussed in Section 4.10 of the site-wide EIS/EIR (U.S. DOE, 1992). The California Air Resources Board conducts criteria pollutant monitoring in the San Joaquin Valley Air Basin to determine the area's ambient air quality and to determine the basin's compliance with Federal and State ambient air quality standards. When an area meets compliance standards, it is classified as an "attainment area" under Federal law. The entire San Joaquin Valley Air Basin, including Site 300, is designated as an attainment area for all criteria pollutants except ozone (O_3) and particulate matter less than 10 microns in size (PM_{10}). Elevated levels of O_3 and PM_{10} are a result of transport from urban areas, mobile source emissions, and agricultural activities. Ambient air quality at Site 300 is not measured directly. LLNL collects monthly air samples at Site 300 to analyze for certain metal particulates and radioactivity, but these pollutants are not standard measures of air quality, as commonly defined by the State of California. LLNL's sampling indicates that airborne contaminant levels are well below regulatory standards (U.S. DOE, 1999a). Air sampling results are published in Chapters 4 and 5 of the 1998 Annual Environmental Report (U.S. DOE, 1999a).

Water Resources

A description of the existing groundwater resources is presented in Chapter 1 of the Site-Wide Feasibility Study (Ferry et al., 1999). Water resources are also described in Section 4.11 of the site-wide EIS/EIR (U.S. DOE, 1992).

Drainage at Site 300 remains primarily in its natural state; drainages are mainly located in steep-walled canyons, and 100-year floodplains or terraces are typically not present. No perennial streams exist on or near Site 300. Runoff occurs within ravines and intermittent stream channels during and following heavy rains. Except for small areas in the northeastern and northwestern portions of Site 300, runoff that does not infiltrate the ground eventually discharges into Corral Hollow Creek, an intermittent stream near the southern perimeter of the site. Such discharges, however, are sporadic. Flow may be direct runoff, with a contribution from intermittent and perennial springs, or from man-made sources. The nearest 100-year floodplain to Site 300 is along Corral Hollow Creek across from the main entrance to Site 300. Floodplains are described in the site-wide EIS/EIR Appendix G (U.S. DOE, 1992).

Other surface water bodies and discharges at Site 300 include 24 seeps and springs located throughout the site (U.S. DOE, 1992; Ferry et al., 1999). Most of the springs have very low flow rates and typically consist of small marshy areas, pools of water, or vegetation. Only three of the springs that are monitored by LLNL have flow rates greater than one gallon per minute. These include Spring 6 (located southeast of Building 845), Spring 12 (located in the far western portion of the site, not near any buildings), and Spring "GEOCRK" (located on ranch land east of Site 300).

Wetlands at Site 300 were mapped during 1991, and a total of 6.76 acres of wetlands were identified (U.S. DOE, 1992). These wetlands are small in size and are located in areas associated with natural springs or runoff from four on-site building complexes (Buildings 865, 801, 827, and 851). Most wetlands (totaling 4.58 acres) occur at springs in the bottom of deeper canyons in the southern half of the site. Other wetlands result from permitted discharges of cooling tower blowdown. The only non-spring-fed natural wetland observed on site is a 0.32-acre seasonal pool in the northwest section of Site 300. Several new wetlands have been discovered since the 1992 EIS/EIR was published. DOE concluded that the 1992 EIS/EIR adequately addressed any potential impacts to the newly discovered wetlands from continued operations. Wetlands are also described in Chapter 2, section 3 of the Site-Wide Feasibility Study (Ferry et al., 1999).

Surface water samples have been collected and analyzed from Corral Hollow Creek, on-site drainages, other ephemeral surface water runoff sources in the vicinity of Site 300 facilities, and from several springs across the site. Volatile organic compounds and tritium have been detected at 3 springs located in the Pit 6 Landfill area (Spring 7), Building 832 Canyon (Spring 3), and the High Explosives Process Area (Spring 5). Of

these, only Spring 3 in the Building 832 Canyon has any potential for off-site flow. Sampling in the Building 832 Canyon during the rainy seasons of 1996 and 1997 indicated no detectable contaminants are flowing off-site from Spring 3. Tritium concentration has been monitored in Well 8 Spring in the Building 850 area since 1971 with a generally decreasing trend. Tritium activities have decreased in Well 8 Spring from a historical maximum of 770,000 picoCuries per liter in 1972 to 38,500 picoCuries per liter in 1999. Flow from Well 8 Spring is less than 200 gallons per day, with no potential for off-site flow.

Groundwater used for operations at Site 300 is pumped from production wells in the western part of the General Services Area. This water system is operated under a permit from the California Department of Health Services. No contaminated groundwater is currently used for human consumption. Risk from exposure to soil and soil vapor contamination is controlled through site access restrictions and site safety procedures.

Much of the contaminated groundwater at Site 300 occurs in isolated or perched water-bearing zones, and does not communicate with regional aquifers. Except for the General Services Area, which is undergoing remediation not covered in this document, no contaminated groundwater has migrated off site. Low concentrations of TCE (less than 1 microgram per liter) have sporadically been detected in a private well directly off site from the distal portion of the High Explosives Process Area plume (the Maximum Contaminant Level (MCL) for TCE is 5 micrograms per liter). Also, low concentrations of chloroform (at a maximum of 4.9 micrograms per liter in 1990) have been detected in a private well near the Pit 6 Landfill (the MCL is 100 micrograms per liter). The chloroform appears unrelated to the Landfill release.

The city of Tracy, located northeast of Site 300 (Figure 1), uses groundwater from alluvial aquifers in the San Joaquin Valley, which are isolated from contamination at Site 300 by thick claystone layers and a horizontal distance of more than five miles. Modeling suggests that contaminants from Site 300 will not impact groundwater used in the Tracy area.

Plant and Animal Life

Numerous special-status plant and animal species are present at Site 300 and reflect the range of ecosystems found in the area. Site 300 occupies an area of ecological transition between coastal and interior habitats which increases the diversity and richness of species present compared to similar-sized areas in California. Adjacent to the southeastern boundary of Site 300 lies the 91-acre Corral Hollow Ecological Reserve administered by the State of California Department of Fish and Game. Species and habitats observed in the last seven years at Site 300 which enjoy special Federal and/or State status (i.e., special-status or rare) are identified in Table 3. This table also indicates

where the species or habitats have been observed. Table 4 is a more comprehensive list that includes species or habitats that have the potential to occur in the Site 300 vicinity. A brief discussion of the biota follows the Tables.

Table 3. Selected special-status and rare species and habitats observed or potentially occurring in the vicinity of the eleven contamination areas at Site 300.

Contaminated Area	Special-status species and habitats												
	California red-legged frog 2,5; 3,7	American badger 13	Valley elderberry longhorn beetle Habitat 2,5	Alameda whipsnake 2,5; 1,5	Alameda whipsnake Critical Habitat (proposed) 2,5	Western burrowing owl 2, 7; 3,7	California tiger salamander 2, 11; 3,7	Big tarplant 9	Large-flowered fiddleneck 1,6; 2,6	Large-flowered fiddleneck Critical Habitat 1,6;2,6	Wetlands	San Joaquin kit fox Habitat 2, 6; 1, 6	Other
Bldg. 834		✓						✓				✓	
Pit 6 Landfill	✓	✓			(✓)		✓				✓		
High Explosives Process Area	✓	✓	✓		(✓)		✓	✓			✓		Golden eagle (2, 10; 3, 7) nests, Western spadefoot toad (2, 7; 3, 7)
Bldg. 850 Firing Table		✓				✓		✓			✓	✓	
Pit 2 Landfill	✓	✓					✓	✓			✓	✓	
Bldg. 854	✓	✓	✓	✓12	(✓)		✓	✓	✓	✓	✓		
Bldg. 832 Canyon	✓	✓									✓		Tricolored Blackbird (2,7; 3, 7)
Bldg. 801, Pit 8 Landfill		✓				✓		✓			✓	✓	
Bldg. 833		✓						✓				✓	
Bldg. 845 Firing Table, Pit 9 Landfill		✓				✓		✓				✓	
Bldg. 851 Firing Table	✓	✓				✓		✓			✓	✓	

1- State (S)
2- Federal (F)
3- California Dept. of Fish and Game (CDFG)
4- California Native Plant Society (CNPS)
5- Threatened (T)
6- Endangered (E)
7 - Species of Concern (SC)
8 - California Native Plant Society 1A (CNPS-1A)
9 - California Native Plant Society 1B (CNPS-1B)
10- Protected (P)
11- Candidate
12- Hybrid California whipsnake subspecies
13- Previously 1, 7; currently protected on site

Table 4. Special-status species and habitats observed or potentially occurring in the vicinity of Site 300.

Common Name	Latin Name	Protection Status
Vascular Plants		
Big tarplant	*Blepharizonia plumosa ssp plumosa*	California Native Plant Society List-1B
Large-flowered fiddleneck	*Amsinckia grandiflora*	Federal and State Endangered
Diamond-petaled poppy	*Eschsholizia rhombipetala*	Federal Species of Concern, California Native Plant Society List-1A
Beetles		
Valley elderberry longhorn beetle	*Desmocerus califronicus dimorphus*	Federally Threatened
Amphibians		
California tiger salamander	*Ambustoma tigrinum californiense*	Federal Candidate Species, California Dept. of Fish and Game Species of Concern
California red-legged frog	*Rana aurora draytonii*	Federally Threatened, California Dept. of Fish and Game Species of Concern
Western spadefoot toad	*Scaphiipus hammondii*	Federal and California Dept. of Fish and Game Species of Concern
Reptiles		
Alameda whipsnake	*Masticophis lateralis euryxanthus*	Federally and State Threatened
Western Pond Turtle	*Clemmys marmorata*	Federal and California Dept. of Fish and Game Species of Concern
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	Federal and California Dept. of Fish and Game Species of Concern
California horned lizard	*Phrynosoma coronatum frontale*	Federal and California Dept. of Fish and Game Species of Concern
Birds		
Tricolored blackbird	*Agelaius tricolor*	Federal and California Dept. of Fish and Game Species of Concern
Western burrowing owl	*Athene cunicularia*	Federal and California Dept. of Fish and Game Species of Concern
Golden eagle	*Aguila chrysaetos*	Federally Protected and California Dept. of Fish and Game Species of Concern
Northern harrier	*Circus cyaneus*	California Dept. of Fish and Game Species of Concern
White-tailed kite	*Elanus leucurus*	State Protected
California horned lark	*Eremophila alpestris actia*	California Dept. of Fish and Game Species of Concern
Cooper's hawk	*Accipiter cooperii*	California Dept. of Fish and Game Species of Concern
Sharp-shinned hawk	*Accipiter striatus*	California Dept. of Fish and Game Species of Concern
Prairie falcon	*Falco mexicanus*	California Dept. of Fish and Game Species of Concern
Mammals		
San Joaquin kit fox	*Vulpes macrotis mutica*	Federally and State Endangered
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	Federal Species of Concern
American badger	*Taxidea taxus*	Currently protected by LLNL policy

Species and Habitat Discussions

Plant species and communities at Site 300 generally fall into two broad groupings: Central Valley and Central Coastal Californian. The major vegetation type, non-native grassland (*Avena barbata* is the dominant grass species), is representative of the Central Valley. Other plant communities include wetland, native grassland, coastal sagescrub, oak woodland, and riparian woodland. A detailed systematic survey for populations of rare and endangered plants was conducted at Site 300 in the spring of 1986 (U. S. DOE 1992, page F-1). Also, a survey was conducted in 1991 in support of the 1992 EIS/EIR (U. S. DOE 1992), and the most recent plant findings are outlined in a 1997 site-wide update report (Jones and Stokes, 1997) on species richness at Site 300.

Wetland habitats at Site 300 have expanded in size and distribution during the last eight years during which periods of average and above-average rainfall have occurred. Two isolated seasonal pools are present in the northwest corner of the site containing plant species adapted to the changing conditions. No protected species of fairy shrimp have been identified at these pools. Neither pool is close enough to the eleven contaminated areas to be potentially impacted.

Native grassland, coastal sagescrub, oak woodland, and riparian woodland communities are patchily distributed across the site and are ecologically located in habitats of specific characteristics (e.g., aspect, soil moisture and content). Special-status plant species that occur at Site 300 within these vegetation communities are identified above.

Two of the three known natural populations of the large-flowered fiddleneck (*Amsinckia grandiflora*), a federally listed endangered plant species, occur at Site 300. A 160-acre portion of Site 300 (southeast of the Building 854 area) has been designated as federal critical habitat for the plant. In addition, LLNL has established an experimental population within the designated critical habitat. LLNL is currently working with the U. S. Fish and Wildlife Service on continued monitoring of native and experimental *Amsinckia grandiflora* populations, and to further develop habitat restoration and maintenance techniques. Investigations into the use of herbicides, controlled burns, and native bunch grass transplantation to reduce the amount of exotic grass cover are currently underway as part of a U. S. Fish and Wildlife Recovery Plan for the species. In 2000, this Critical Habitat area was also designated as a Federal "Reserve" under a memorandum of agreement between the Department of Energy and the U. S. Fish and Wildlife Service. It appears that the smaller of the two native populations of *Amsinckia grandiflora* was extirpated in 1997 when the bank containing the population was washed away. No plants were observed at this site in 1998-2000.

Two additional sensitive plants species were identified at Site 300 in 1997. The big tarplant (*Blepharazonia ssp plumosa*), a California Native Plant Society "Rare" plant, was found to be widely distributed within the grassland ecoregion. Also, a population of a plant not seen in California since 1950, the diamond-petaled poppy (*Eschscholzia rhombipetala*) was identified in the southwestern portion of the site. Monitoring of the big tarplant and the diamond-petaled poppy has continued since 1997. The big tarplant remained widespread throughout Site 300. A total of 26 diamond-petaled poppies were located in 1998. Of these, 18 plants produced seed-bearing pods.

Blue elderberry bushes (*Sambucus mexicana*) are found in distinct mesic canyon habitats at Site 300. No valley elderberry longhorn beetles have been observed on site, but exit holes that match qualities of the threatened beetle have been observed in several stands of the elderberry bush (U.S. DOE 1992).

The presence of red-legged frogs and California tiger salamanders on site is associated with wetland habitats, while spadefoot toads and western pond turtles are found in and adjacent to the floodplain of Corral Hollow Creek.

Alameda whipsnake habitats are generally restricted to coastal sagescrub areas on site, and the majority of these occur in the southwest corner of Site 300. Only intergrades of the protected Alameda whipsnake and the common chaparral whipsnake have been identified at Site 300. Critical habitat (Unit 5) proposed by the U. S. Fish and Wildlife Service in the Federal Register March 8, 2000 (65 FR 12155) may encompass approximately 2,300 acres of land in the southwestern portion of Site 300, including the already-designated *Amsinckia grandiflora* critical habitat and the ground above the groundwater contaminant plume of at least the Building 854-contaminated area. Both the San Joaquin whipsnake and California horned lizard have been observed at Site 300. Live-trapping surveys for Alameda whipsnakes were performed in the spring of 1998 in areas of Site 300 containing south-facing rock outcrops with sagescrub vegetation. All whipsnakes captured were taxonomic gradations between both the protected "Alameda" and the non-protected "chaparral" whipsnakes. Site 300 is located at the eastern edge of habitat considered suitable for Alameda whipsnake distribution. During the public comment period for the Alameda whipsnake critical habitat designation, DOE proposed to the U.S. Fish and Wildlife Service to reduce the critical habitat to approximately 700 acres consistent with coastal sagescrub structure and habitat interface criteria.

Of the sensitive bird species listed in Table 3 as occurring at Site 300, the golden eagle and burrowing owl are the most widely observed. Tricolored blackbirds have not been recorded nesting on site during the past five years, although several gregarious flocks forage at Site 300 during March and April.

Site 300 is located in the extreme northern portion of the range of the San Joaquin kit fox. No direct observations of San Joaquin kit fox have been made during detailed

studies in 1980, 1986, 1990, 1991 (U. S. DOE 1992), or during any pre-project surveys between 1993 and 2000. The San Joaquin pocket mouse was observed at Site 300 during field surveys in 1986, 1990, and 1998.

Discussion of Species and Habitat by Contaminated Area

Below is a discussion of species and habitats by contaminated area. Species and habitats discussed below have been observed in the subject area in the last seven years (with the exception of the San Joaquin kit fox, which has never been observed at Site 300).

Building 834 Area

The mapped Building 834 contaminated area consists of a xeric upland of annual grassland with a low biological diversity component that includes the big tarplant (Table 3). The American badger is the only protected wildlife special-status wildlife species that is known to occur in the area. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Pit 6 Landfill Area

The mapped Pit 6 Landfill contaminated area is approximately 30 meters above the 100-year floodplain of Corral Hollow Creek. Several lowland wetlands occur in the vicinity of the project area and are occupied habitat for several special-status species such as the California red-legged frog and the California tiger salamander. The surrounding grassland is habitat for the American badger.

Coastal sagescrub habitats occur in the northern and western portions of the Pit 6 Landfill area and are included in a proposed (March 2000) designation by the U. S. Fish and Wildlife Service (FWS) as Alameda whipsnake critical habitat. However, DOE proposed during the public comment period that this area does not fulfill the criteria for suitable habitat.

High Explosives Process Area

The mapped contaminated area for the High Explosives Process Area contains both upland and wetland habitats and a variety of native special-status species (See Table 3). The red-legged frog and tiger salamander may utilize the Building 817 High Explosives rinse water retention ponds during the summer or winter seasons. A known golden eagle nest site occurs in the vicinity of the High Explosives Burn Pit portion of the Process Area. Western spadefoot toad may also occur.

A portion of the High Explosives Process Area has also been proposed as critical habitat for the Alameda whipsnake by the FWS, however, DOE proposed during the public comment period that this area does not fulfill the criteria for suitable habitat. The High Explosives Process Area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 850 Firing Table Area

The mapped Building 850 Firing Table contaminated area occurs in an upland setting dominated by grassland. A single, non-occupied, low-diversity herbaceous wetland is present near Building 850. The three most common sensitive species that occur in the area are the burrowing owl, American badger, and big tarplant. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Pit 2 Landfill Area

The mapped Pit 2 Landfill area occurs in an upland setting with a watershed drainage adjacent to the project site that contains wetland features and big tarplant, and contains habitat suitable for the tiger salamander, red-legged frog, and the American badger. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 854 Area

The Building 854 mapped plume area is the most complex biological area of the eleven areas considered in this EA. Four different habitat communities are present: (1) coastal sagescrub, (2) oak woodland, (3) annual grassland, and (4) wetland. Special-status species that occur in the area are shown in Table 3. Coastal sagescrub habitats occur in the western and southern portions of the proposed project area and are included in a proposed (March 2000) designation by the U. S. Fish and Wildlife Service as Alameda whipsnake critical habitat. The eastern portion of the contaminated area is also included within the critical habitat designation for the large-flowered fiddleneck (*Amsinckia grandiflora*). This area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 832 Canyon Area

The mapped Building 832 Canyon contaminated area is mostly annual grassland with an ephemeral drainage to Corral Hollow Creek. The wetlands present in the stream channel from the Building 830 vicinity downstream are supported with water from several low-flow springs. The Building 832 Canyon area has been a site for a nesting colony of tricolored blackbirds and these areas

are protected during the nesting season from March to June. However, no tricolored blackbirds have been observed nesting during the last several years. Wetland habitat may be suitable for the red-legged frog, depending on the season and annual rainfall. American badger may also utilize the surrounding upland grassland areas.

Building 801, Pit 8 Landfill Area

The mapped Building 801 contaminated area, including the Pit 8 Landfill, is in an annual grassland community with two special-status species with potential occurrence: the American badger and the burrowing owl. A wetland occurs near the access road to the Building 801 area. The big tarplant has been observed in the area. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 833 Area

The mapped Building 833 contaminated area is in an annual grassland habitat with the American badger potentially present. The big tarplant has been observed in the area. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 845 Firing Table, Pit 9 Landfill Area

The mapped Building 845 area, including the Pit 9 Landfill, is in an annual grassland community with two special-status species with potential for occurrence: the America badger and the burrowing owl. The big tarplant also occurs. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Building 851 Firing Table Area

The mapped Building 851 contaminated area is in an upland grassland area (quite arid except for the discharge from the building cooling tower). Special-status species that could be present in the area are the red-legged frog, American badger and burrowing owl. Frog presence is possible during the wet season. The big tarplant has been observed. This area also contains habitat marginally suitable for the San Joaquin kit fox.

Land Use and Socioeconomics

The majority of Site 300 lies in San Joaquin County, which is a leading agricultural county, with associated industries for food processing, wholesale trade, and transportation. Important non-agricultural employers include

educational institutions, federal defense installations, wholesale distribution and transportation centers, and related service industries. Major transportation networks and facilities in the county include interstate and local highways, several major rail carriers, the Stockton Metropolitan Airport, and the Port of Stockton. Industrial activities are allowed if they are compatible with the County's applicable criteria for industrial land use.

Most of the area surrounding Site 300 is ranch land, privately held in parcels of section size (640 acres), although land immediately adjacent to Corral Hollow Road in the vicinity of Site 300 is generally held in smaller parcels ranging in size from 5 to 640 acres (Figure 3). The San Joaquin County General Plan has three designations for land use in the Site 300 area. The portion of Site 300 located in San Joaquin County, and the other adjoining public parcels, are zoned as "Public Facility." The area to the north and east of Site 300 is designated "Residential," and is under the jurisdiction of the city of Tracy. The remainder of the land is zoned "AG 160," which is for general agriculture.

LLNL operations at Site 300 are consistent with the San Joaquin County General Plan land use designations (U.S. DOE, 1992). Although there is no prime agricultural land at Site 300 or immediately adjacent to it, surrounding land is used primarily for cattle grazing. Much of the land adjacent to the Site 300 southern boundary is part of the Union Livestock and Gallo Ranches. Along the eastern site boundary is a 91-acre Ecological Reserve operated by the California Department of Fish and Game. Two private organizations have also tested high explosives on land holdings adjacent to the south and east portions of the site. The State of California operates the 1,500-acre Carnegie State Vehicular Recreation Area located along the southwest side of Site 300 on Corral Hollow Road.

A Final Environmental Impact Report has been prepared for the proposed City of Tracy Urban Management Plan / General Plan. The Tracy Planning Area encompassed by the Plan would "build out" to a population of 160,000 by the year 2013. Under the Plan's land use map, Site 300 is designated as "Federal Reserve / Open Space." Site 300 operations would be consistent with this land use designation. Under the Plan's proposed action, the City of Tracy also proposes to designate land adjoining the east portion of the Site 300 north border and the northern portion of the Site 300 east border as "Open Space." The open space would create a buffer of approximately one to one and a half miles in width between Site 300 and residential elements of the development. The buffer zone would be used for cattle or sheep grazing, and would have limited access points at existing trails for hikers, mountain bikers, and equestrians. The proposed development, bounded by Site 300 on the southwest side and extending beyond Interstate 580 to the northeast, is the location of the proposed

Tracy Hills Community Area / Urban Center, which would consist of residential developments with two dwelling units per gross acre or less. Tracy Hills, together with its commercial and industrial elements, would have a projected population of 23,000 by the year 2013.

The population of San Joaquin County increased by 8.2 percent between 1990 and 1995, to a total population of 530,652. The Site 300 region, on average within a 50-mile radius, does not have more minority or low income populations than the State average (U.S. DOE, 1999b). Furthermore, environmental monitoring of similar activities at Site 300 shows no adverse impact to surrounding communities. Therefore, there are no Environmental Justice issues related to this project. In 1989, San Joaquin County had a total employed labor force of 181,000. The annual workforce at Site 300 averages about 300 people, with temporary increases during construction projects. Most of the Site 300 workforce is based within the General Services Area, where about 150 employees are currently assigned. Cleanup work would be performed by existing personnel, and would not require that LLNL hire additional employees.

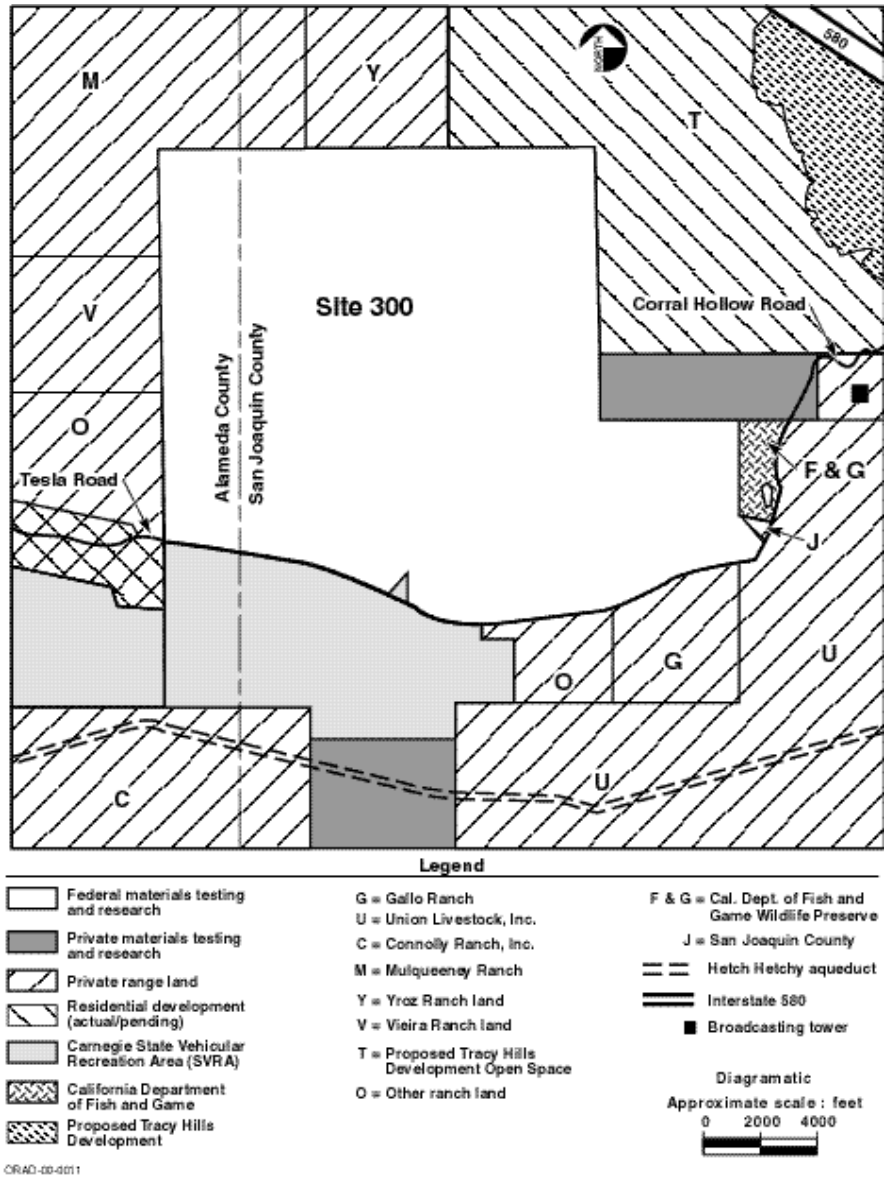

Figure 3. Land use in the vicinity of Site 300.

Health and safety are primary concerns at Site 300, and dominate the overall layout, design, and operations. Employee health and safety measures, restricted site access, and a large buffer zone to the east and north all isolate the public from potential hazards and contribute to public health and safety.

Infrastructure

The 1992 EIS / EIR contains a description of the infrastructure of Site 300, as well as information on natural resources (Section 4.8.2), public services (Section 4.4), traffic (Section 4.13), materials and waste management (Section 4.15), and utilities / energy consumption (Section 4.14).

Traffic density near Site 300 is low. Site 300 lies 18 road miles from the LLNL Livermore Site and 10 road miles from central Tracy (Figure 1). The only access to Site 300 is from Corral Hollow Road on the southern boundary of the site. Interstate 580 lies to the north and east of the site. Patterson Pass Road is located north of Site 300, but provides no access to the site. The primary access routes in the area are Corral Hollow Road from either the Livermore Valley or from I-580 and Tracy. Approximately 32 percent of the Site 300 workers reside in Tracy. Traffic counts on Corral Hollow Road indicate that of the 325 average daily trips, approximately two-thirds are to or from Site 300 (Rueth and Berry, 1995). Traffic density on Corral Hollow Road will undoubtedly increase if the Tracy Hills Community Area / Urban Center matures to a population of 23,000.

Noise

The background noise at Site 300 is primarily from wind and vehicle traffic on Corral Hollow Road. Away from structures, wind noise levels may range from 70 to 80 decibels with gusts on ridgetops up to 90 decibels (U.S. DOE, 1992). Detonations of explosives during experiments at firing tables at Site 300 can cause instantaneous short-term peak impulse noise level increases, occasionally to levels near 126 decibels (Rueth and Berry, 1995). Other noise sources include Interstate 580; the Tracy Airport; the explosives testing at the nearby private facilities; traffic on Corral Hollow Road; and off-road vehicles operating in the Carnegie State Vehicular Recreation Area.

Aesthetics

Site 300 is predominantly hilly grassland with some blue oak trees, coastal sagescrub, and rock outcrops. Paved roads link the widely scattered facilities. Much of Site 300 is not visible from any public road or from publicly held lands. Annual controlled burning of grass at Site 300 impacts the aesthetic quality of portions of the site. However, those portions of Site 300 that are burned are only partially visible from Corral Hollow Road or Site 300's northern and eastern boundaries. Furthermore, many other landowners in the area also conduct springtime controlled burning on their properties to prevent wildfires during the summer when weather conditions create extreme fire hazards. The controlled burns at Site 300 are essential to prevent uncontrollable burns that could result from explosives testing. In addition, the controlled burns are thought to be the primary cause for the continued health of the large acreage of native perennial bunch grass communities at Site 300; these communities are rare throughout California (U.S. DOE, 1992).

Cultural Resources

Archaeological evidence indicates that the Central California area has been inhabited since 9,000 B.C. Although little is known about the earliest prehistoric peoples, the Site 300 area is within the ethnohistoric tribal boundaries of two California Native American groups: the Costanoans (Ohlone) and the Northern Valley Yokuts. Current sentiment holds that the area was probably used sporadically by both tribes for marginal hunting and gathering (Rueth and Berry, 1995). It is also generally accepted, based on early historic writings, that Corral Hollow was a major travel route for Native Americans passing back and forth between the central valley (or the Sierras) and the San Francisco Bay Area (Rueth and Berry, 1995). During the Hispanic and American historic periods (ca. 1750–1930), grazing and coal and clay mining were established in Corral Hollow Canyon. Three company towns were built in the canyon to support the coal and clay mines and factories. Portions of the largest town, Carnegie (population 2,500), were located inside the southern boundary of Site 300 and south of Corral Hollow Road. By 1912, Carnegie was abandoned and, shortly after, completely dismantled. By 1919, only mine tailings, plant foundations, dredging mounds, and miscellaneous depressions marked the industrial past of Corral Hollow Canyon.

Archaeological surveys conducted at Site 300 in 1976, 1981, and 1993 located 29 archaeological sites: seven prehistoric, 21 historic, and one multi-component site.

4. Environmental Impacts

This Chapter describes the potential environmental impacts of the alternatives presented in Chapter 2. It also contains a discussion of cumulative impacts, which can be defined as the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions.

Earth

Under the proposed action alternative, there would be no significant impacts to earth. Approximately 20 acres (less than one percent of the 7000-acre site) of soil disturbance would occur in association with well drilling, road construction, placement of treatment units, trenching for utilities, and removal of contaminated soil near the Building 850 Firing Table. The construction activities would be distributed throughout the site at the eleven contaminated areas. Some of the 20-acre disturbance would occur on previously disturbed soil. Contaminated soil from the Building 850 Firing Table would be removed, disturbing approximately one acre of surface soil surrounding the firing table, to a depth of approximately six inches. This one-acre disturbance would occur on previously disturbed soil. Temporary trenches and pits would be filled and restored. The concentrations of contaminants in soil vapor would decrease with operation of treatment facilities. The soil disturbance would not cause unstable earth conditions or create erosion because it would be limited in depth and extent, and would be dispersed throughout the site.

Under the no action alternative, construction associated with on-going treatability study projects would cause soil disturbance; however, it would cause less disturbance than the construction associated with the proposed action alternative. The concentrations of contaminants would likely decrease over time due to natural attenuation process.

Cumulative impacts to soil, under both alternatives, would occur in conjunction with other construction activities on site. These impacts include soil-disturbing activities such as grading, excavation, and trenching. Cumulative impacts to earth would not be significant under either alternative. Very little construction occurs at Site 300 relative to urban areas or other industrial sites.

Air

Under the proposed action alternative, there would be no significant impacts to air. Potential impacts to air quality would include air emissions from soil vapor treatment facilities and fugitive dust associated with construction activities. All treated soil vapor would be discharged to the atmosphere in

compliance with San Joaquin Valley Unified Air Pollution Control District Rules and Permits utilizing Best Available Control Technologies. Because permits have been granted for all the soil vapor treatment units at Site 300, it is assumed that there would be no increased health risk, on-site or off-site, from the emissions of the treatment units. Over time, the concentration of the soil vapor contaminant being treated would decrease. In any case, however, the controlled release from the treatment facility would always be of low concentration since the treatment facility emissions are to be adsorbed onto activated carbon. Fugitive dust would be minimized by dust suppression measures, when necessary, according to Air District Rules and internal LLNL policies. Suppression measures include: use of watering trucks, covering soil piles with tarps, and chemical treatment (covering areas of loose, bare soil with lime to form a crust that hardens the top layer such that wind cannot disturb it). There would be no degradation of any air resource which would individually or cumulatively result in a loss of biological diversity among the plants and animals.

Under the no action alternative, a slow release of volatile organic compounds from soil vapor dispersion and evapotranspiration from soil and shallow groundwater would likely continue for decades. However, treatability study projects may continue treatment of soil vapor, further reducing the concentration of contaminated vapor released by these processes.

Cumulative impacts to air quality at Site 300 would not be significant under either alternative. All Site 300 projects that could potentially contribute to cumulative impacts to air are permitted by the Air District. The Air District evaluates each new emission individually, as well as cumulatively, with respect to all existing emissions at Site 300. Site 300 has Facility-wide Requirements issued by the Air District and sitewide maximums for many pollutants. In addition, the Air Resources Board reviews annual hazardous and toxic emissions from Site 300, and the U.S. EPA also regulates the sitewide emissions via a permit review system.

Water Resources

All water quality issues associated with this project are overseen by the RWQCB. The RWQCB reviewed and commented on the Site-Wide Feasibility Study (Ferry et al., 1999), a document that evaluated different cleanup technologies for Site 300. Furthermore, the RWQCB also participated in the selection of the cleanup technologies that are presented as part of the proposed action alternative in this Environmental Assessment, and will have signatory authority over the Interim Site-Wide Record of Decision.

Under the proposed action alternative, there would be no significant adverse impact to surface water or groundwater. Any soil-disturbing activities or discharge of treated water to the surface would comply with the RWQCB substantive requirements and the requirements of *Storm Water Pollution Prevention Plan, Site 300, Lawrence Livermore National Laboratory, Livermore, California, May 1994*, or subsequent revisions. Clean water effluent from treatment units would be discharged such that no new wetlands would be created. Because the vast majority of water feeding off-site wells comes from areas unaffected by groundwater extraction for remediation, private wells near Site 300 will not be significantly affected. Effective treatment of groundwater could improve water quality in springs. Groundwater would be beneficially impacted under the proposed action alternative as water quality would improve more quickly than it would without treatment.

Under the no action alternative, surface water and groundwater in most areas would be monitored for contaminant concentrations and the direction and rate of groundwater flow. Existing treatability study projects would continue treatment. Where treatment is not occurring, contaminant levels should decrease over time through dilution and by natural attenuation processes such as biodegradation, dispersion, evapotranspiration, and abiotic degradation; however, rates of decrease might be less than those achievable through treatment under the proposed action alternative. Monitoring would detect contaminants that have the potential to migrate to off-site water supply wells, thereby allowing ample time for DOE to respond and correct the situation. Furthermore, a contingency plan would be prepared under CERCLA to address such issues. Monitoring would continue as long as necessary, as determined by the RWQCB.

There would be no significant cumulative impacts to water resources as a result of either alternative.

Plant and Animal Life

There would be no significant impact to special-status or rare species and habitats as a result of either the proposed action or the no action alternative. Locations of all known plant and animal resources have been evaluated with respect to locations of all proposed construction activities (Table 3). The results of this evaluation indicate that construction activities with known locations would not significantly impact plant or animal life; however, the locations of all construction activities over the life of the project have not been determined. LLNL has a wildlife protection program that protects special status species and habitats in accordance with Federal and State regulations, as well as internal LLNL guidelines. In the event that plant or animal resource is discovered near the location of future construction activities, the proposed activities would be

shifted to allow DOE to accommodate special-status resource findings and on-site protection measures. If a resource were found that could not be avoided, supplemental analysis would be required and mitigation might be required.

Prior to any ground-disturbing operations, a pre-activity survey would be performed to determine if special-status species or habitats are present. Pre-activity requirements may include nighttime spotlight censuses, live sampling of populations, and/or monitoring activities. Special permitting requests of the appropriate resource agencies would be undertaken as may be required by the Federal or State Endangered Species Acts or California Department of Fish and Game codes. Prior to any construction activities, all construction personnel would be briefed on the appearance, identification, and habits of the special-status species that occur in the area and the required actions should one be discovered.

Releases of treated water through an air misting system is not expected to adversely impact wildlife. Misting may support slightly greater amounts of annual and perennial grasses in the release area; however, some of these grasses would be burned during annual controlled burning at Site 300. LLNL currently operates an air misting system at Building 834. Since the air misting system began operating at Building 834 in 1995, there have not been significant changes in the number of plant species or the number of individuals present in the release area. The experience at Building 834 indicates that wildlife would not be attracted to the air misting site(s).

Contaminants in soil vapor or indirect ingestion of soil elements have been identified as a health risk for burrowing animals (such as ground squirrels if they use the area for denning). The removal of contaminants from soil vapor would be increased under the proposed action alternative as a result of dewatering the aquifer and the exposure of more soil to the treatment process. Therefore, the health risk to burrowing animals should be reduced. Monitoring for the presence of special-status species in the immediate area of contamination would continue for as long as considered appropriate for the contamination levels present.

Neither alternative would contribute to cumulative impacts to special-status species, their habitats, or other species protected by LLNL policies.

Land Use and Socioeconomics

Under the proposed action alternative, there would be no significant impact to land use and socioeconomics. Successful groundwater and soil remediation could enhance future land use or raise land values. Remediation would not violate any zoning plans or other land use controls, nor would it

affect population, housing, or recreation. While restricted access to Site 300 plays a major role in protecting public health and safety, remediation of groundwater and soil provides additional protection by reducing the potential for human exposure to contaminants. Health risks are discussed in Chapter 1 of the Site-Wide Feasibility Study (Ferry et al., 1999). A goal of the cleanup effort is to reduce contaminant concentrations to levels that are protective of human and ecological health. The possibility for treatment facilities and monitoring wells to remain in place for as long as 30 years may place constraints on how DOE uses those particular locations of Site 300. This is not considered to be significant.

Under the no action alternative, volatile organic compounds present in surface soil could volatilize and be released to the atmosphere. In some areas of Site 300, the Baseline Risk Assessment estimates of both individual excess lifetime cancer risk and non-cancer Hazard Index exceeded acceptable limits as defined by the U.S. EPA (See Chapter 1 of Ferry et al., 1999). Since these estimates were above acceptable limits, the potential future uses of these areas could be limited with a corresponding reduction in economic value. With time, contaminant concentrations in soil and groundwater should decrease through dilution and natural attenuation processes. Implementation of the no action alternative would not impact current population, housing and recreation, nor would it violate zoning plans or other land use controls.

There could possibly be cumulative impacts to land use under the no action alternative. Since the availability of groundwater is a significant constraint to land use, groundwater contamination could have the potential to adversely affect land use at Site 300. The range of uses of Site 300 could also be affected by soil contamination.

Infrastructure

Under the proposed action alternative, there would be no significant impacts to infrastructure. There would be no impact to "natural resources" such as gas and electric lines / capacity / services (as defined on page 25, California EPA, 1996), and there would actually be a beneficial impact to water resources upon successful completion of remediation activities. Many treatment units would be solar-powered. There would be no impact to public services because the number of additional personnel involved with the remediation work would be insignificant. LLNL does not foresee hiring additional personnel to perform the proposed remediation work.

Minimal impacts would be associated with increased traffic and generation of waste and its transport for off site regeneration and / or disposal. Traffic at Site 300 would be minimally increased by construction activities,

monitoring additional wells, servicing treatment units, and collecting/transporting waste.

Water and soil vapor treatment units currently use approximately 3,600 pounds of granular activated carbon each year. Approximately 80 percent of the carbon is collected by an off-site vendor and regenerated. The remainder is handled by LLNL's waste management facilities. Under the proposed action, an estimated 1,600 additional pounds would be used by new treatment facilities. This would represent an increase of approximately 40 percent over the current amount of carbon used. Approximately ten percent of the new carbon would be handled by LLNL's waste management facilities, and the rest would be collected by an off-site vendor for regeneration. Therefore LLNL's waste management facilities would see roughly a 200-pound increase (from processing 600 to 800 pounds) in spent carbon per year. This increase is well within the handling capacity for LLNL waste management facilities.

In addition, the removal of contaminated soil from the Building 850 Firing Table would generate a one-time shipment of potentially low-level and mixed low-level radioactive waste for off site disposal. Approximately 1,260 cubic yards of soil would be transported off site for disposal. Assuming it would be hauled in 20-cubic yard trucks, approximately 63 trips would be required. The trips would likely not occur on the same day, and therefore would not contribute significantly to the 325 average daily trips on Corral Hollow Road. The impacts associated with shipment of contaminated soil and other waste generated by this project are addressed in the U.S. DOE Environmental Assessment on *Off-Site Transportation of Low-Level Waste from Four California Sites Under the Management of the U.S. Department of Energy Oakland Operations Office* (U.S. DOE, 1997b) and its October 31, 1997, Finding of No Significant Impact. Furthermore, impacts are also discussed in the 1992 EIS/EIR, sections B.3.2, B.3.5, and D.2.8.9.

Other waste generated by the project includes contaminated drill cuttings. All such soil is tested for contamination; hazardous soil is contained and handled by the Hazardous Waste Management Division of LLNL.

Under the no action alternative, there would be no significant impacts to infrastructure. There would be no impact to “natural resources” or public services. Treatability study cleanup activities would continue to improve water quality, but not at the rate or level achievable under the proposed action alternative. There would be no increase in traffic or waste generation; those would continue at their current levels with minor fluctuations for on-going treatability study activities.

This project would not contribute to cumulative impacts to infrastructure. Site 300 roads can accommodate the additional traffic associated with the

proposed cleanup activities, and increased activity would not contribute to the need to upgrade existing roads. LLNL's waste management facilities are capable of handling projected quantities of waste resulting from the cleanup actions under the proposed action alternative.

Noise

Under the proposed action alternative, there would be no significant impact with respect to noise. Vehicular activity associated with monitoring and sample collection would continue to result in minor periodic incremental increases in ambient noise levels. Construction activities would result in a short-term increase in noise level. Treatment facility operation and well drilling would also contribute to an increase in ambient noise levels. These noise levels are anticipated to be insignificant and there are very few nearby receptors. The majority of the surrounding land consists of rangeland, open space, and a State Vehicular Recreation Area, none of which would be affected by temporary noise increases (Figure 3). There is one residence near the Pit 6 Landfill (Figure 2) , but no construction would be undertaken at that Pit 6 site. Furthermore, this residence is isolated (more than one mile) from the majority of the construction activity that would be occurring at Building 834, the High Explosives Process Area, Building 850 Firing Table, Building 854, and the Building 832 Canyon. Furthermore, the incremental noise increase caused by the proposed action is minor in comparison to the noises generated by the State Vehicular Recreation Area and pistol firing range located adjacent to the residence, as well as by the explosives testing which occurs periodically at Site 300.

Under the no action alternative, there would be no change in existing noise levels.

There would be no significant cumulative impacts with respect to noise as a result of either alternative.

Aesthetics

Under the proposed action alternative, construction associated with road building and new treatment units would slightly change the aesthetics of Site 300. Because roads and buildings already exist on site, and very little of Site 300 is visible from public roads, this impact is anticipated to be insignificant.

Under the no action alternative, there would be no impact to aesthetics.

There would be no significant cumulative impacts to aesthetics as a result of either alternative.

Cultural Resources

There would be no impact to cultural resources under either the proposed or no action alternative. LLNL has developed procedures to comply with federal and state historic preservation laws and regulations. The LLNL archaeologist and project personnel would work together to identify specific locations of ground disturbance. Locations of all known cultural resources have been evaluated. If field survey and project site visits identify that a project activity may have the potential to impact a historic property because of its proximity, the location of the activity would be moved so that there would be no impact. The project locations have sufficient flexibility that they can be relocated to areas where they would not impact cultural resources. While it is always possible that subsurface cultural resources may be encountered during ground disturbing activities, LLNL would comply with the requirements of Section 106 of the National Historic Preservation Act (36 CFR 800.11: Properties discovered during implementation of an undertaking) and the 1992 EIS/EIR Mitigation Measure 4.2.1 which requires employees and contractors to report unearthed evidence of cultural resources. Such evidence may include, but is not limited to, ground or flaked stone tools, shell, bones, beads, trash areas, weathered boards, metal, glass, pottery, pipes, bricks, and square nails. Work within the vicinity of the find would be stopped until the archaeologist assesses the find. Any necessary mitigation measures to protect significant finds would be developed and implemented in conjunction with DOE, the State Historic Preservation Office, and the Advisory Council on Historic Preservation.

There would be no significant cumulative impacts to cultural resources as a result of either alternative.

5. Agencies/Persons Consulted

The following agencies / persons were consulted during preparation of this document:

The City of Tracy

San Joaquin County

California EPA Department of Toxic Substances Control

6. References

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7. Acronym List

CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
DTSC	Department of Toxic Substances Control
EA	Environmental Assessment
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
HMX	High melting explosive
LLNL	Lawrence Livermore National Laboratory
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
OU	Operable Unit
PCB	Polychlorinated biphenyls
PCE	Perchloroethylene
RDX	Research department explosive
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
TBOS	Tetrabutyl orthosilicate
TCE	Trichloroethylene
TKEBS	Tetra-kis-2-ethylbutyl orthosilicate
VOC	Volatile organic compound

Appendix A: CEQA Elements

Project Name:

Interim Site-Wide Record of Decision

Site Location:

Lawrence Livermore National Laboratory Site 300 is located in the Altamont Hills, approximately 18 miles east of the City of Livermore and 10 miles southwest of the City of Tracy, in San Joaquin and Alameda Counties, California. It is a restricted-access U.S. Department of Energy (DOE) facility. The entrance to Site 300 is approximately three miles east of U.S. Interstate 580, along Corral Hollow Road. Site 300 is found on the Midway U.S. Geological Survey 7.5-Minute Series quadrangle.

Contact Person/Address/Phone Number:

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(510) 540-3832

Project Description:

See Chapter 2, "Alternatives."

Agencies Having Jurisdiction Over the Project/ Types of Permits Required:

U.S. Department of Energy

U.S. Environmental Protection Agency

California Environmental Protection Agency, Department of Toxic Substances Control

Regional Water Quality Control Board, Central Valley Region

San Joaquin Valley Air Pollution Control District

Appendix B: Accident Scenarios

NEPA reviews of proposed actions need to consider the potential impacts to the environment resulting from reasonably foreseeable accidents. The NEPA review need not, however, consider potential impacts resulting from incredible accidents that are based on pure conjecture and are not within the rule of reason (CEQ, 1986). CEQA requires a similar analysis, called a "Risk of Upset," which should consider the full range of potential significant impacts that could occur under upset conditions. Upset conditions include not only events associated with natural disasters and associated unforeseen emergencies such as fire, but those events more commonly called accidents. Accidents include those caused by human error, equipment malfunction or failure, and sabotage (California EPA, 1996).

Given that the nature of the project is to remove contaminants that exist in soil and groundwater, one of the most plausible accidents would involve a spill of groundwater in the treatment area. Spills could be caused by natural disasters, human error, or equipment malfunction. An accident could occur during a groundwater pipeline rupture or discharge pump failure, as discussed in the Feasibility Study for the General Services Area (Rueth and Berry, 1995, pp. 6-18). LLNL has engineered their treatment systems to prevent such accidents. Safety features such as pressure switches and float switches will shut down well pumps if the system suddenly stops operating correctly. When the well pump is shut down, the extraction of contaminants for treatment stops. Once the system is shut down, a technician must evaluate what went wrong, and manually re-start it.

A second type of potential accident could occur during the transport of soil from the Building 850 Firing Table area (low-level radioactive waste). The 1992 EIS/EIR (page D-55) outlines the results of analyses of transportation accidents involving low-level radioactive waste. The likelihood of transportation accidents is reduced by compliance with LLNL waste handling procedures, U.S. Department of Transportation procedures, and other applicable regulations.

LLNL's Integrated Safety Management program requires that all operations be reviewed for potential hazards and that controls be developed prior to the work being authorized. This type of review cannot only prevent accidents, but aid in the emergency response process should an accident occur.